A CRITICAL STUDY OF THE WORK “VYMANIKA SHASTRA”

by

H.S. MUKUNDA§, S.M. DESHPANDE§, H.R. NAGENDRA§§,
A. PRABHU§, AND S.P. GOVINDARAJU§
Indian Institute of Science, Bangalore-560012 (Karnataka)

SUMMARY – A study of the work “Vymanika Shastra” is presented. First, the historical aspects and authenticity of the work are discussed. Subsequently, the work is critically reviewed in respect of its technical content. It appears that his work cannot be dated earlier than 1904 and contains details which, on the basis of our present knowledge, force us to conclude the non feasibility of heavier-than craft of earlier times. Some peripheral questions concerning dimensions have also been touched upon.

1. Historical Aspects

1.1ORIGIN

A book titled “Brihad Vimana Shastra” by Shri Bramhamuni Parivrajaka was published in the year 1959 [1]. It contains verses in Sanskrit (describing aircraft) with their Hindi translation.

Recently, another book titled “Vymanika Shastra” by Shri G.R. Josyer has appeared [2], which contains the same Sanskrit verses with their English translation. One notable feature of this English version is that it contains drawings of some crafts too, something not to be found in the Hindi version. Also, the English work by Josyer makes no mention whatsoever of the earlier work in Hindi.

Our main concern in this report will be with the above two works.

These books contain verses which, according to their texts, are supposed to form only part (about a fortieth) of “Yantra Sarvaswa” by sage Bharadwaja, which is devoted to a summary of the work on vimana vigyana by a number of other sages and is said to be for the benefit of all mankind.

1.2 DATING OF THE WORK

In his introduction to the “Brihad Vimana Shastra” (hereafter denoted as BVA) the translator has tried to hind at the Vedic origin of the text. In support of this he has invoked Maharshi Dayananda Saraswati’s work entitled “Rigaveda Bhashya Bhumika” [3]. Also, some quotations from western scholars are given in support of the clain for antiquity.

According to Maharshi Dayananda Saraswati’s commentary (first published in 1878 or earlier), there are references to aircraft in the Vedic mantras:

त्रय: स्कम्भास: स्कभितास आरभे
त्रिनक्त याथस्त्रिर्व श्वना दिवा ॥ ५ ॥
ऋ० अष्ट० १ । अ० ३ । वर्ग् ४ ।
म० २ ॥

….going from one island to another with these crafts in three days and nights….and

आ नो नावा मतीनां यान् पाराय
गन्तवे …….. ॥ ९ ॥ ऋ० अष्ट० १ ।
अ० ३ । व० ३४ । मं० २ ॥ कृष्णं
नियानं हरय: सुपर्णा अंपो वसाना दिव
मुत्पतन्ति । त आववृत्रन्त्सदन….॥१०॥
द्वादश प्रधयश्चक्रमेक त्रीणि नम्यानि क
उतच्चिकेत । तस्मिन्त्साक त्रिशता न
शकवो ऽ पिता घष्टिनं चलाचलास:
॥ ११ ॥ ऋ० अष्ट० २ । अ० ३ ।
व० २३ । म० १ । २ ॥

Just an intelligent people constructed ships to cross oceans…..jumping into space speedily with a craft using fire and water…..containing 12 stamghas (pillars), one wheel, three

§ Departmental of Aeronautical Engineering
§§ Department of Mechanical Engineering

machines, 300 pivots, and 60 instruments.

These, however, are too vague, scanty, and totally inadequate to date their (verses) content to the Vedic period. Further, we are afraid we may be attributing meaning to shlokas based on what we know today. (More on this in Section 1.5).

The manuscript from which BVS was prepared as said to have been available a the Rajakiya Sanskrit Library, Baroda, in 1944. It is also stated in BVS that later another transcript was found in Poona with a signature and dates गो वेंकटाचल शर्मा 9-8-1919 set on it. BVS has been written on the basis of the above two transcripts which are essentially the same. It may be noted that in the introduction to BVS gratitude has been expressed to Air Com. Goel who probably has something to do with the procurement of these documents.

1.3 AUTHORSHIP

As already stated, the authorship of the work has been attributed to Maharshi Bharadwaja. Whether this Maharshi is the same as one of the seven seers (Saptarshis) is by no means substantiated. Thus the question of authorship remains as yet unanswered. It is possible, however, to throw more light on the situation.

In his introductory remarks in the book Vymanika Shastra (VS from hereon) Josyer states that Pandit Subbaraya Shastry of Anekal dictated the verses to Shri G. Venkatachala Sharma (G.V. Sharma from hereon). No further details of the process in which the work came into existence have been given in VS.

However, we were able to locate Shri G.V. Sharma and Shri Venkatarama Shastry (adopted son of Pandit Subbaraya Shastry) with help from a retired scholor from the Tirupati Sanskrit Library, Shri Srinivasa Iyengar, who seems t have played some part in transactions relating to the transcripts in question. Discussions with both Shri Sharma and Shri Venkatarama Shastry cleared up many points concerning the history of the documents.

Shri G.V. Sharma was a close associate of Pandit Subbaraya Shastry (Shastriji from hereon) during his later years. It appears that Shastriji, who was supposedly endowed with certain mystical powers, used to spell out shlokas (verses) whenever he got inspiration. These used to be promptly taken down by Shri Sharma. After the full text had been so dedicated, copies were made which later found their way to several places, Most of this and other similar materials were kept in charge of Shri Venkatrama Shastry after the death of Shastriji in 1941.

The existence of the manuscript was known in some circles and that probably is how Air Com. Goel came to know of it and had it procured from the Baroda University Library sometime during 1944.

Sometime during 1951, Shri Josyer established an organization, called International Academy of Sanskrit Research. An exhibition of rare manuscripts was held during the inaugural function. Shri M.C. Krishnaswamy Iyengar, another associate of Shastriji, (who has published the English translation of the autobiography of Shastriji [4]) took some of the manuscripts, including the "Vymanika Shastra", and had them exhibited there. Subsequently, the original manuscript and the drawings were procured and retained by Shri Josyer. The drawings were not contained in the transcripts which reached the Baroda University Library. That perhaps is why BVS lacks the drawings.

1.4 AUTHOR'S LIFE SKETCH

The authorship, as stated earlier, has been traced to Shastriji. It may be worth recording some of his life history to appreciate the situation in a better perspective. Following is a brief life sketch of Shastriji summarized from reference [4]. It appears that the autobiography was written to fulfil a promise made to Jagdish Chandra Bose (the well-known scientist) by Shastriji, during one of the discussion meetings at Bombay.

Shastriji was born in a small village in Hosur Taluk (Madras State) and got married at the age of eight. His parents died a few years later and he was forced to support the large family, including brothers and sisters, virtually by begging. Subsequently, he went to stay with his father-in-law, but soon had to leave with his brothers and sisters, looking for alms at other towns. Thereafter, things got worse. Sometime later, his sisters and one of his three brothers died of small-pox. He himself got such a severe attack that he no longer could move or use his own hands. His brothers perforce had to leave him to himself and move away. He had to live on grass and other leaves, like and animal, for a period of time. He then came to an area near Kolar (Karnataka) in a most pitiable state. It is stated that there he met a great saint, referred to as Guruji Maharaj in the text. This

saint cured him of his terrible disease, initiated him into spirituality and revealed to him secrets of many shastras like Vimana Shastra, Bhautik Kala Nidhi, Jala Tantra, etc. in a cave.

Later on, Shastriji came back to Anekal and settled down with his wife to a quiet life. Circumstances forced him to adopt Shri Venkatarama Shastry as his son. Because of innate spirituality and mysticism, he came to influence many people, some wise, some rich, and some both. He then made several trips to Bombay and dictated Parts of Vimana Shastra there. He had the drawings (of aircraft) made sometime between 1900 and 1919 by someone called Ellappa who was a draughtsman in a local engineering college at the time.

Shastriji had no formal training (for schooling) of any kind. He learnt to read and write Telugu and Kannada scripts only when he came back after meeting Guruji Maharaj. His early boyhood and youth were spent in braving some of the worst calamities that can befall a man.

What appears strange in the whole matter is that Pandit Subbaraya Shastry, who apparently was not a 'pnadit' in anyordinary sense, dictated a work and nowhere in it did his name appear. Also, it was written as though Maharshi Bhadadwaja were its author. Any possible fraud in the matter, in our opinion, is out of the question sine Shastriji was known for his utter simplicity, humble and un[pretentious nature. It is also stated in his autobiography that he was unsure of the practicality of the ideas propounded in Vymanika Shastra. (The theory itself is highly unsound in our view). Also stated one late Dr. Talpade (of Bombay) tried to make models under the guidance of Shastriji, but that he was not successful in making any of then fly.

1.5 DISCUSSION

The dating of the work VS may be approached from other angles: (a) The kind of Sanskrit used in the text may indicate whether or not the text is of Vedic origin.

The text contains Shlokas set to अनुष्टुप metre and its language is quite simple and modern. Again, in its introduction, BVS mentions that a few words did have a structure similar to that of the Vedic Sanskrit. The number of such words being very small, and their usage being incidental, it appears appropriate to conclude that the Sanskrit used in the text is modern. (b) Another significant point is the almost complete absence of any mention of use of aircraft in the innumerable Sanskrit texts of the post-Vedic age. One text, namely "Samarangana Sutradhara", by Bhoja deals with some description of aircraft, but does not quote any earlier work. What is more, Bhoja states that detailed description of their construction and other features will not be given lest the same be used for evil purpose by people? (We are tempted to remark that he did not know!)

The most important of texts like Ramayana and Mahabharata make no mention of the use of aircraft for travel, military, or war purposes. The 'Pushpak Vimana' of Ramayana, as described therein, has no flying qualities except possibly by invocation of 'mantras' or 'tantras'. Of course, a discussion of whether these existed at all is undecideable within the realm of science and is beyond the scope of this paper.

Thus it appears to us from internal and related evidence that the work VS is of recent origin.

Despite these and other facts mentioned earlier Shri Josyer states in the introduction to his book [2] that the work is several thousand years old; the book in Hindi [1] tends to hint at the vedic origin of the text.

What we feel unfortunate in history is that some people tend to eulogise and glorify whatever they can find about our past, even without valid evidence. In the absence of any evidence, efforts will be made to produce part of the evidence in favour of antiquity. The above two works are by no means exceptions to this, in particular the recently published book. In fact the introduction to Reference [2] is least scholarly by any standards. We feel that the people connected with publication – directly or indirectly – are solely to blame either for distorting or hiding the history of the manuscripts.

1.6 CONCLUSIONS

Thus the work "Vymanika Shastra" was brought into existence sometime between 1900 and 1922 by Pandit Subbaraya Shastry by techniques unclear to us at the moment. The only evidence in favour of Maharshi Bhardwaja being the author is the textual statement and nothing more.

2. Technical Survey And Criticism

2.1 GENERAL

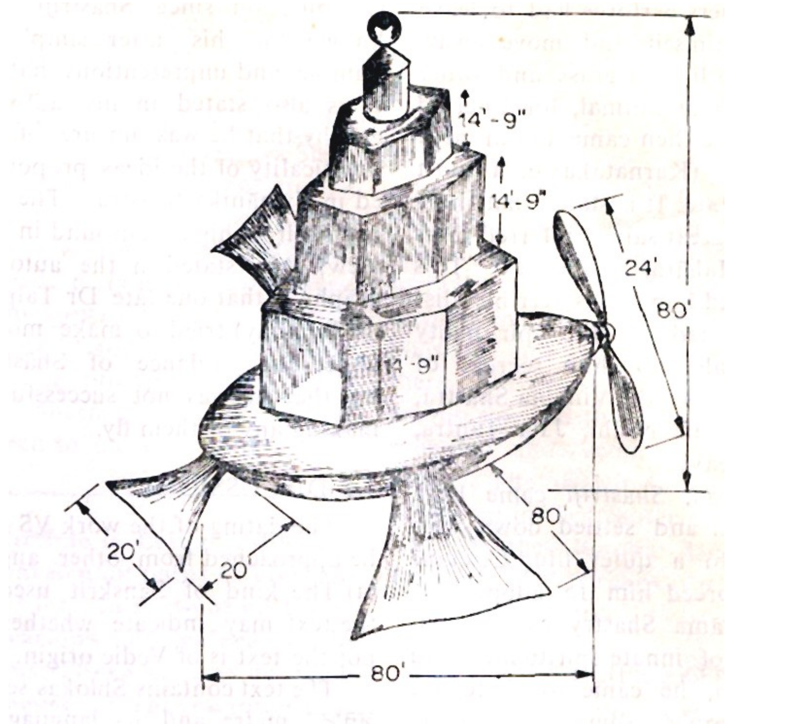
A general treatise on any subject, particularly as complex as aeronautics, starts off with an

enunciation of the basic principles involved and subsequently discusses the integration and development of these principles into a technology. This is indeed so with any of the treaties on modern science or technology. Contrary to this, the Vymanika Shastra gets down to details right away; even here there is no expression of any kind of generality. The different parts (of aircraft) are quantitatively described as though a particular plane were being described.

The science of aeronautics requires an understanding of a number of disciplines: aerodynamics, aeronautical structures, propulsive devices, materials, and metallurgy. The subject works lay uncalled for emphasis on propulsive devices and structures, but little or no emphasis on aerodynamics. It is worth pointing out that the history of aeronautics (western) in regard to production of heavier-than-air craft is studded with initial failures, significantly traceable to a non-understanding of aerodynamics [5].

The works [1,2] under discussion contain description and details on the definition of an airplane, a pilot, aerial routes, food, clothing, metals, metal production, mirrors and their uses in wars, varieties of machinery and yantras, planes like 'mantrik', 'tantrik', and 'kritak'. Details about four planes in the 'kritak' category – Shakuna, Sundara, Rukma, and Tripura – are also given.

We will address ourselves principally to the above mentioned four planes; the discussion will be on the basis of principles, geometry, materials, chemistry, and operational data.



SHAKUNA VIMANA

[Note: The accompanying aircraft diagrams are given merely to aid visualization and are not to scale.]

2.2 SHAKUNA VIMANA

2.2a General – As the name suggests, this vimana (plane) is like a bird. It is supposed to contain the following parts: Peetha (floor board), hollow mast, three wheeled keelakas (hinges) with holes, four heaters, air suction pipes, water jacket, oil tank, shakuna yantra, two wings, tail portion to enable the vimana to fly, owshyamaka yantra or heat engine, etc.

It has several tiers, each one containing different yantras (machines). The drawings show parts like cylinder, piston worm gear, and pumps which seem entirely modern (beyond 18th century).

2.2b Principles – A few lines have been devoted to the function of wings and tail and they appear to be incorrect. From what is given in the following verses:

तथैव वातपायन्त्रो दिक्प्रदर्शध्वजस्तया ।
पश्चाच्छकुन्स्य्स्न्त्राश्च तत्पक्षद्वयमेव च ॥
विमानोत्पेक्षणार्थ तत्पुच्छभागस्तयैव हि ।
ततो विमानसञ्चारकारणौष्म्यकयन्त्रक: ॥

It appears that great importance is given to the tail portion for the generation of lift. Also the function of the hinge wings becomes unclear in this context. It may be noted that it is the wings which should contribute to the life of the craft and the tail portion to its controllability.

2.2c Geometry – The height and width of the craft, in our opinion, are in such proportion as to put its stability in serious question. There are inconsistencies in the dimensions mentioned in the

verses and those given in the drawings. For

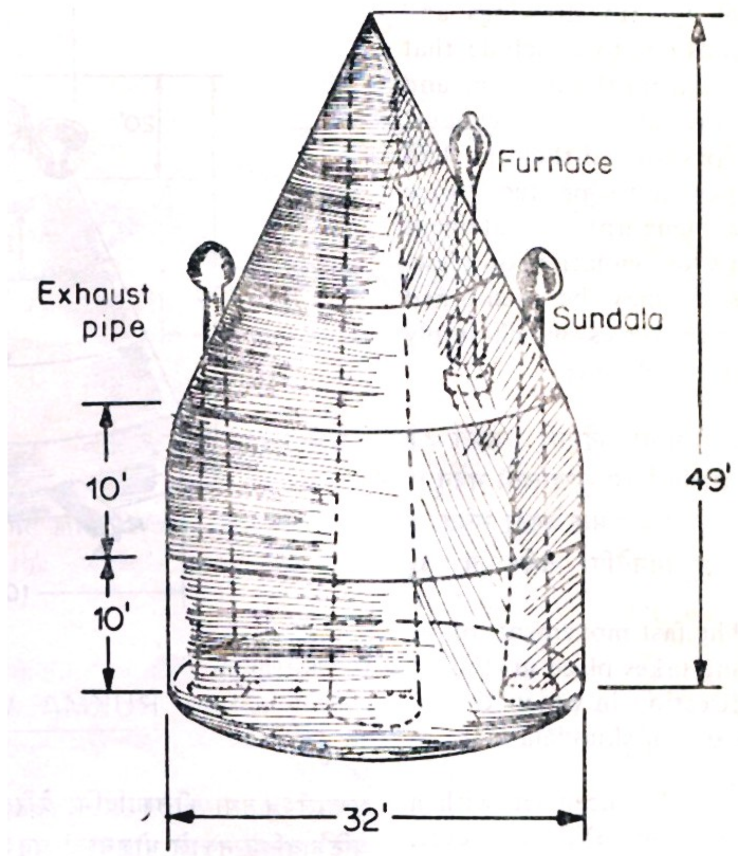
पीटोन्नत्यं वितस्तीनामशीतिरिति वर्णितं ।
पट्पञ्चाशद्वितस्तीनामायामं च तथैव हि ॥

Here the dimensions are as follows. The floor board height is 80 feet; its width and length are 56 feet each. The latter dimensions are different in the drawings, being 80 and 25 feet respectively. In the verses, 'vitasti' is used as a unit of length while in the drawings 'foot' is adopted. The value of vitasti varies from 9 inches to a foot depending upon the situation in which the term is used. Here it appears as though vitasti has been equated to a foot at all places.

2.2d Operational data – There are no statements on the capabilities of this craft.

2.2e Materials – There is mention of a number of materials. The floor board is made of 'raja loha'. This material, supposedly, is to be made from 'prana kshara' (ammonium chloride), Bengal gram, benzoin, mercury borax, mica, silver, and 'panchamrita'(!), all mixed, heated to 800 'kaksha' (unit of temperature), and poured out. There is a number of other materials described herein.

2.2f Comments – It must be pointed out here that the essential idea of flying like a bird has been tried by many people (abroad) over several centuries right from the time of Leonardo-da-Vinci, but without any success whatever. Hence the feasibility of a craft of the above type is a near impossibility. Furthermore, the author – whoever he be – shows a complete lack of understanding of the dynamics of the flight of heavier-than-air craft.



SUNDARA VIMANA

2.3 SUNDAR VIMANA

2.3a General – This plane meant for flight only in the air has five tires and a number of parts.

आदौ पीठस्ततो धूमनालस्तंभस्तथव हि ।
पश्चाद् धूमोद्गमयन्त्रपञ्चकं च ततः परं॥

These are: ground plate, smoke chimney, five gas engines, metal pipe wind blower, electricity generator, four faced heater, and outer cover.

2.3b Principles – The place has been described in considerable detail though no basic principles of operation have been mentioned. From what may be salvaged as principles, we have the following: electricity is generated by some means (what appears to be a combination of friction, heat, solar rays, waterfall etc.) through use of 'jyotirmukha' and several other materials including sixteen 'drona' measures of donkey's urine! The use of 80 'link' of electricity is expected to vaporize oil. Also, steam is generated separately. It appears that by operating some switches, these two (oil and steam) can be mixed to produce 500 'kaksha' heat. These are then passed through a pipe called 'shundala' (like elephant's trunk) for purposes of propulsion. Further there is detailed description of some machinery. Looking into drawings and the text leads one to conclude that air is

sucked from the bottom, and hot gases are allowed to exhaust through pipes toward the top. And this is expected to produce force to life the plane up a statement which is a gross violation of Newton's laws. It may be mentioned that there are verses which imply such violations clearly:

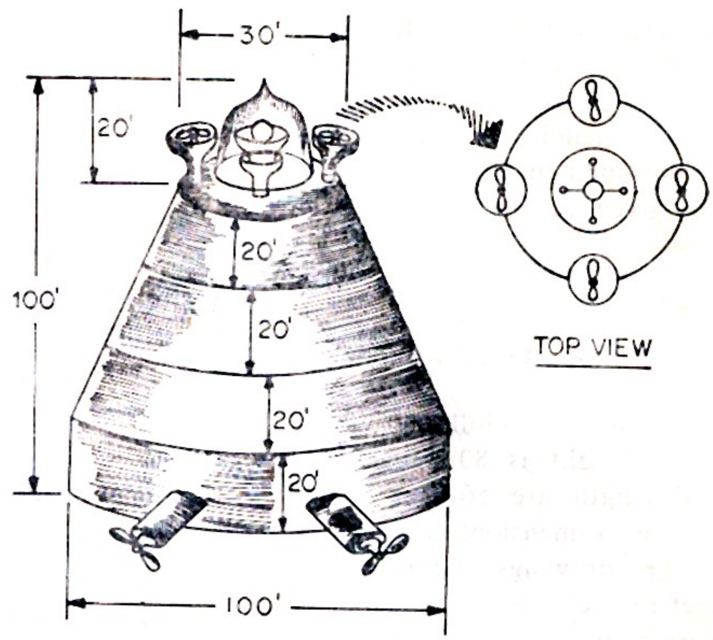
एकदा चक्रगमनागमनाद्वेगतो भवेत् ।
धूमप्रसारण यस्मिन् दिशि शुण्डालतो भवेन्॥
तस्मिन्नेव? विमानस्य गमन वेगतो भवेत् ॥
आवर्तने चोध्र्वमुखगमनेपि तथैव च ॥

"……….The fast movement of the plane takes place in the same direction in which the jet gets out of shundala.."

The shloka has been set with a question mark in BVS. However, in VS Shri Josyer seems to have edited the relevant part of the verse into … स्वयमेव विमानस्य गमनम् …

Because of this editing, meanings of the verses don't tie in properly. In fact, this editing was totally uncalled for and should not have been done. If it was to be performed, it should have been indicated as such.

2.3c Geometry & operational data – It has the shape of a cone-cylinder combination, with a base diameter of 32 feet, cylinder height of 20 feet, and cone height of 29 feet. The whole geometry appears to be one of a mobile factory, if anything, and much less of an aircraft. The speed of smoke from the gas engine (dhoomodga yantra) is said to be 2113 'link'. Wind speed from 'nala stambha' is said to be 600 'link'. Speed of the craft is given in:



RUKMA VIMANA

शुण्डालैश्च तथा कीलकादिभि, प्रेरितक्रमात् ।
घटिकावच्छिन्नकाले योजनाना चतुश्शतम् ॥

Four hundred yojanas are covered in one ghatika.

Ghatika has a standard implication of 24 minutes. Yojana has an implication of about 8 to 10 miles (some interpret yojana to mean more). Even with the smaller figure the craft speed amounts to 8000 mph – fantastic figure by any standards. It may be noted that no aircraft of today has attained such speed inside the atmosphere.

2.3d Chemistry & materials – One of the vessels used for production of electricity is expected to be filled with apamarga, sampasya, and ayaskanta soaked in elephant's urine mixed with mercury. Another vessel is to be filled with cow's urine, and so on. There are several other descriptions in a similar vein without any possible sense.

2.4 RUKMA VIMANA

2.4a General – This plane has a five tier structure, with passenger cabins on the third tier. The plane is meant for flight only in the air.

2.4b Principles – This aircraft is the one which some of us thought meaningful quite some time back while studying BVS. AT that time VS (containing the drawings) was not available. From BVS we conclude that there were long vertical ducts containing fans at the top. The direction of airflow was not indicated in the text. We presumed, therefore, that upward flight would be feasible by running the fans to suck air from the top and send it down the ducts, generating a lift in the process, essentially like a vertical takeoff and landing craft (VTOL).

In the text it is stated that lift is generated by the beating of 'ayahpinda' wheels against the floor board. Electrical tube wheels

are supposed to aid flight in a manner not discussed at all. The purpose of fans has not been indicated in the text, whereas in the figure they have been captioned as “lifting fans”. Further, like in other crafts, the static stability is in some doubt.

2.4c Geometry – The geometry is again a cylinder-cone combination with a base diameter of 100 feet, height of 20 feet, and cone height of 80 feet. The text mentions a dimension of 1000 feet for the base.

पीठ रुक्मविमानस्य कूर्माकारं पकल्पयेत् ।
वितस्तिहसायामं गात्रमेकवितस्तिकम् ॥

However, the drawing shows only 100 feet. This is a geometrical contradiction.

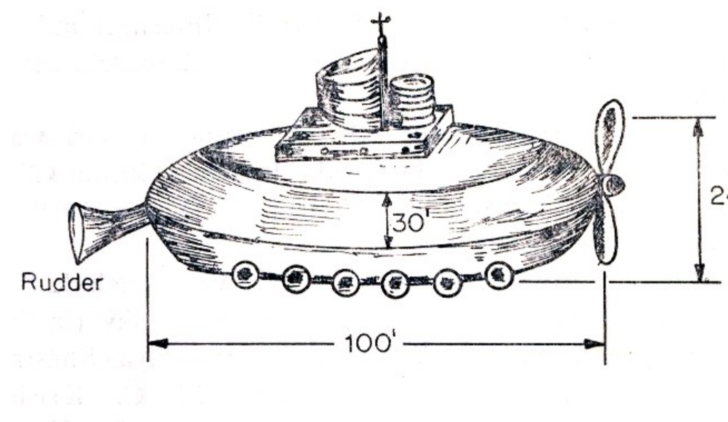
2.4d Operational data – The Description mentions a speed of 105 kroshas per ghatika amounting to a speed of 625 mph (compared to the speed of sound of about 760 mph). This is an incredible speed even for a sleek aircraft and just impossible for the kind of geometry used.

2.4e Materials – A number of materials is mentioned principal among which is ‘raja loha’.

2.4f Comments – If the craft is taken to mean what the drawings and the text say, it can be stated that the craft is a decided impossibility.

2.5 TRIPURA VIMANA

2.5a General – This plane is supposed to fly in air, and move water and land. When moving over water the wheels are to be retracted.



TRIPURA VIMANA

2.5b Principles – No mention of any principles of operation has been made. Power is said to be generated from the generator from the generator at the top using sun’s rays and some acids in a manner not described. The general description and the diagrams seem to indicate the use of electric motors which were known only in the 19th century.

2.5c Geometry & operational data – It is oval shaped in plan with a length of 100 feet and maximum width of 24 feet. The height of the craft is 30 feet. No operational data have been given.

2.5d Materials – In order to prevent water from seeping into the craft, when it is moving over water, it is said to be covered with a cloth known as milk cloth (क्षीरपट). Also the description of an alloy has been given which is supposed to be light and fire resistant.

3. General Comments and Conclusions

Any reader by now would have concluded the obvious – that the planes described above are the best poor concoctions, rather than expressions of something real. None of the planes has properties or capabilities of being flown; the geometries are unimaginably horrendous from the point of view of flying; and the principles of propulsion make then resist rather than assist flying.

The text and the drawings do not correlate with each other even thematically. The drawings definitely point to a knowledge of modern machinery. This can be explained on the basis of the fact that Shri Ellappa who made the drawings was in a local engineering college and was thus familiar with names and details of some machinery. Of course the text retains a structure in language and content from which its ‘recent nature’ cannot be asserted. We must hasten to point out that this does not imply an oriental nature of the text at all. All that may be said is that thematically the drawings ought to be ruled out of discussion. And the text, as it stands, is incomplete and ambiguous by itself and incorrect at many places.

A large number of verses has been devoted to the metallurgical and material aspects, as stated earlier.

Also, a number of cross references indicated in BVS belong to the subject of materials. (Incidentally, these references are not to be found in VS.) This is understandable since our people were leaders in this field in earlier times. A number of materials made of iron, brass, and bronze, in existence since times immemorial and even till this day, are proofs enough of this feature.

Yet the description of materials and their making in the text do not seem to make much sense from the point of view of making them in actual practice.

Be this as it may, the text raises some peripheral questions. One of them concerns the kind of units used. The basic text uses 'vitasti' for length, 'link' for speed, 'kaksha' for heat, & 'link' again for electrical force. The units of speed and temperature are new and, to the best of our knowledge, do not have any easily decipherable meaning. Some effort was made to determine the internal consistency of these units, but this did not prove successful.

Also, no data have been given about the weights of crafts and their components. This is serious since weight is fundamental to the flying of heavier-than-air machines. Moreover, the unit of mass does not even appear anywhere is the text.

REFERENCES

1. Swami Bramhamuni Parivrajaka, "Brihad Vimana Shastra", Sarvadeshik Arya Pratinidhi Sabha. Dayanand Bhavan, New Delhi, 1959.

2. G. R. Josyer, "Vymanika Shastra", Internaitonal Academy of Sanskrit Research, Mysore-4.

3. Dayananda Saraswati, "Rig-veda Bhashya Bhumika", Vydika Yantralaya, Ajmer, 1929.

4. G. Venkatachala Sharma, The Autobiography (in English of Pandit Subbaraya Shastry), published by M. C. Krishnaswamy Iyengar, and C. Venkatachala Sharma.

5. Theodore von Karmen, "The Aerodynamics", McGraw Hill Company, 1963.

6. Editor's comment – In this context, it must be pointed out that Maharshi Dayanand Saraswati (MDS) in his commentary on the Rigveda (reference 3 above, published first in 1878 or earlier), has also something to say on the subject of movement of aircraft in different directions.

In his comments (on the verses given in Sub-section 1.2 of this article) MDS says:

"……..One of them to halt the craft, one to make it move forward, and the third to make it move backwards. …There be 60 instruments, some working at one time and the others at other times. ….In other words, to lift the lane up, the top openings for steam must be closed and to bring the craft down, steam should appropriately be allowed to exhaust from the top. Similarly, to propel the aircraft eastward, eastward steam openings must be closed and westward ones opened: to take the plane in the westward direction, westward steam openings should be shut and eastward ones opened; and so on for movements in the north and south directions. And there be no mistakes in this. …There are many more verses on the subject (of aircrafts), but the wise will get the idea from whatever little is given here."

The statements above would appear to indicate complete accord with the Newton's laws of motion. Contradictions apparent in the verses and drawings in [1] and [2] are quite puzzling, especially when one considers the fact that [3] was supposedly available when [1] and [2] were compiled.

ERRATUM

In the Sanskrit verse given under Sub section 2.2c (column 1, page 9) पीठोत्नन्यं should read as पीठोत्नन्यं. ★